My Students Learn Differently—

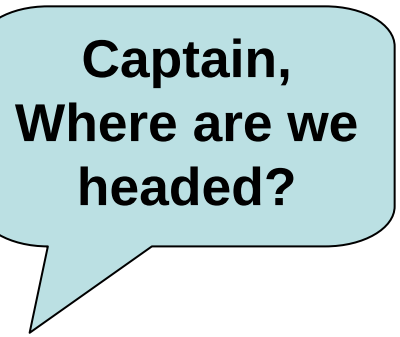
Now What?

Teaching Strategies for Diverse Learners

Neil A. Knobloch, Ph.D.

2007 ACES Fall Teaching Symposium

Overview



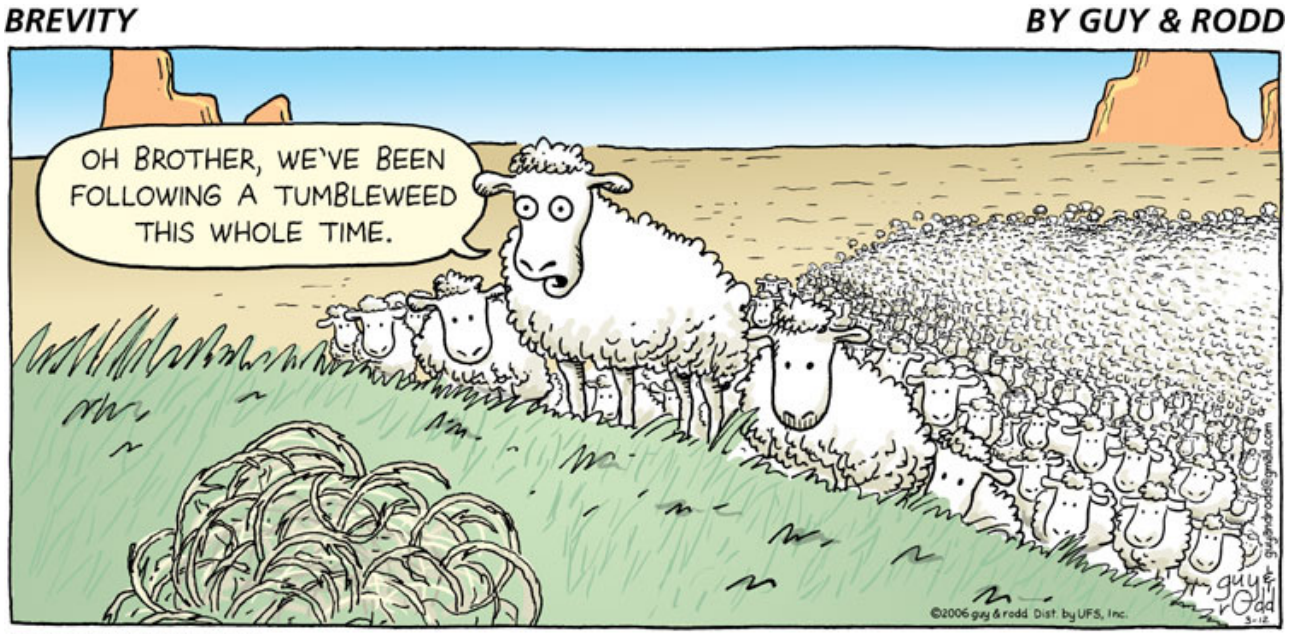
- Learning Styles
  - Why?
  - What?
  - How?
- Learner-Centered Teaching Strategies
- Break
- LCT Examples in College of ACES
  - Active Learning
  - Inquiry Learning
  - Service Learning
- Practical Applications
- Lunch
- Concluding Remarks

Why are learning styles important?

- Acknowledge individual differences (Student-Students)
  - Students learn differently
- Accommodate differences (Teacher-Students)
  - E.g., 80% male instructors in ANSC, 80% female students in ANSC
- Identify one's learning style (Student)
  - Self-assess the assets and liabilities of one's learning style
  - Think about strategies that would help them be more successful
- Self-regulate one's learning
  - Learning styles are not black/white, all or none
  - One can learn how to learn differently

Is this true today?

The study of individual and behavioral differences is the most germane discussion of the problems of education
(Jensen, 1973, p. 1)



What is a Learning Style?

- 26 different styles (Biggs, 2001)
- Learning style
  - How one learns from and adapts to his/her environment (Gregorc, 1979)
  - The interaction of one's behavior and personality as he or she approaches a learning task (Garger & Guild, 1984)
  - The way each person begins to concentrate on, process (thinking), internalize, and remember new and difficult academic content (Dunn & Dunn, 1999)
- Preference-based
  - Perceive (take in) stimuli
  - Process, order, and make decisions about using the stimuli (Feden & Vogel, 2003)

Match the Different Measures

B Extroversion – Introversion
A Active – Reflective

A, B Sensing – Intuitive

C Visual – Verbal
D Concrete – Abstract
A Sequential – Global

D Sequential – Random
B Judging – Perceiving

B Thinking – Feeling

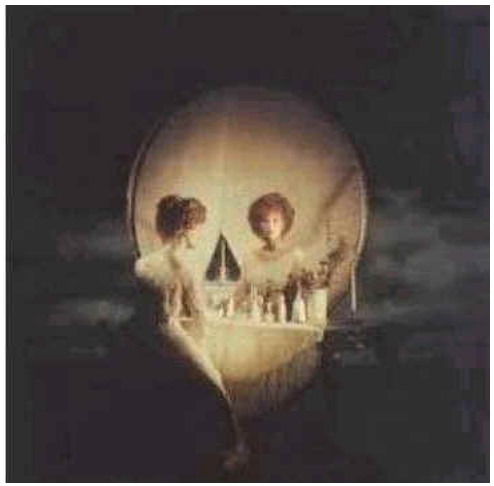
A. Felder-Silverman's Indicator of Learning Styles
B. Jung's Psychological Type-MBTI
C. VARK Modalities
D. Gregorc's Mindstyles

Do learning styles exist?

It is clear that stable personality differences exist and can be measured, and they cohere in ways that allow taxonomy and theory (McCrae & Costa, 1994; cited in Snow, Corno, & Jackson, 1996, p. 245)

What do you see?

- One face or Two?



- Woman or Skull?

We perceive and process information differently

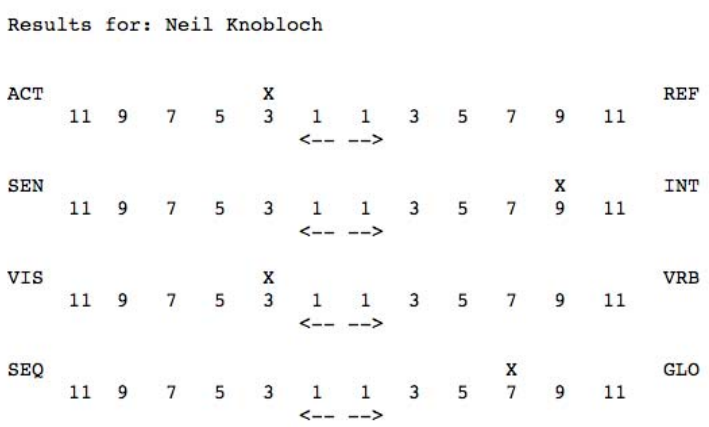
Ice Breaker

- Introductions
- Learning Style Indicator
  - http://tlt.its.psu.edu/suggestions/research/learning_styles.shtml
  - Stand up if you are… (see next slide)

Name, Dept & Learning Style

Index of Learning Styles

- Active-Reflective
- Sensing-Intuitive
- Visual-Verbal
- Sequential-Global



How do people learn differently?

- Need Volunteers
  - Two tables of 4 to play **Dutch Blitz**
  - Two tables of 4 to play **Set**
  - Two tables of 6 to play **Wheedle**
  - One table of 2 to play **Blink**
- Ask one volunteer per table to read the rules, then play a practice round
- Play the game

- Audience: Observe your peers play the game using one of the four learning styles
  - Felder-Silverman's Indicator of Learning Styles
  - Jung's Psychological Type-MBTI
  - VARK Modalities
  - Gregorc's Mindstyles
- Debriefing – What did you observe?

How do you reach diverse learners?

- Focus on learning styles…use a variety of presentation methods, right?
  - Caveat!
- Styles are based on individual differences
  - Leads to a focus on a variety of presentation methods
    - And a de-emphasis on subject-matter concerns
  - Little attention given to difficult issues
    - Content selection
    - Content understanding
  - Mindless eclecticism in instructional style emphasizes packaging and delivery of content (Prawat, 1992)

Focus on Learning Approaches

- Approaches are based on learning tasks (content) and learning environment (context)
  - Focus on student thinking or sense making
  - Thinking is highly contextualized
    - Specific subject…diversity of understandings students' develop when learning domain-specific concepts
    - Specific setting…how individuals interpret various context variables (norms of discourse)

Key Point

- The focus of the symposium is to purposefully use learner-centered teaching approaches to engage diverse learners based on the considerations of the:
  - Learners
  - Nature of content and learning tasks
  - Desired outcomes
  - Roles of teacher and learners
  - Approaches and strategies used to create contexts that engage learners

Teacher Preparation for New Faculty

What is learner-centered teaching?

- Students construct knowledge based on
  - Applying concepts
  - Solving problems that are relevant to students' experiences
  - Performing authentic learning tasks (Knobloch & Ball, n.d.)

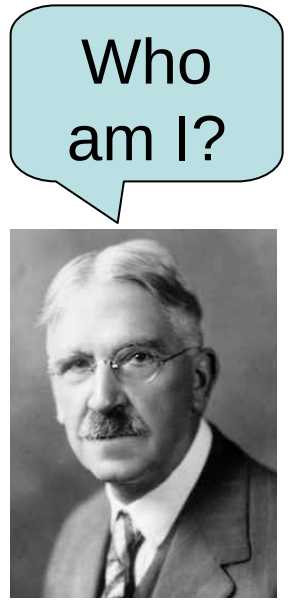
Five principles of LCT

- Five principles (Weimer, 2002)
  - Balance of Power
    - More democratic and egalitarian
  - Function of Content
    - Less on covering it, more on understanding it
  - Role of the Teacher
    - Less on delivery, more on asking questions and uncovering assumptions
  - Responsibility for Learning
    - Independent, autonomous learners
  - Evaluation Purposes and Processes
    - Promotes learning, de-emphasis on grades

LCT Assumptions

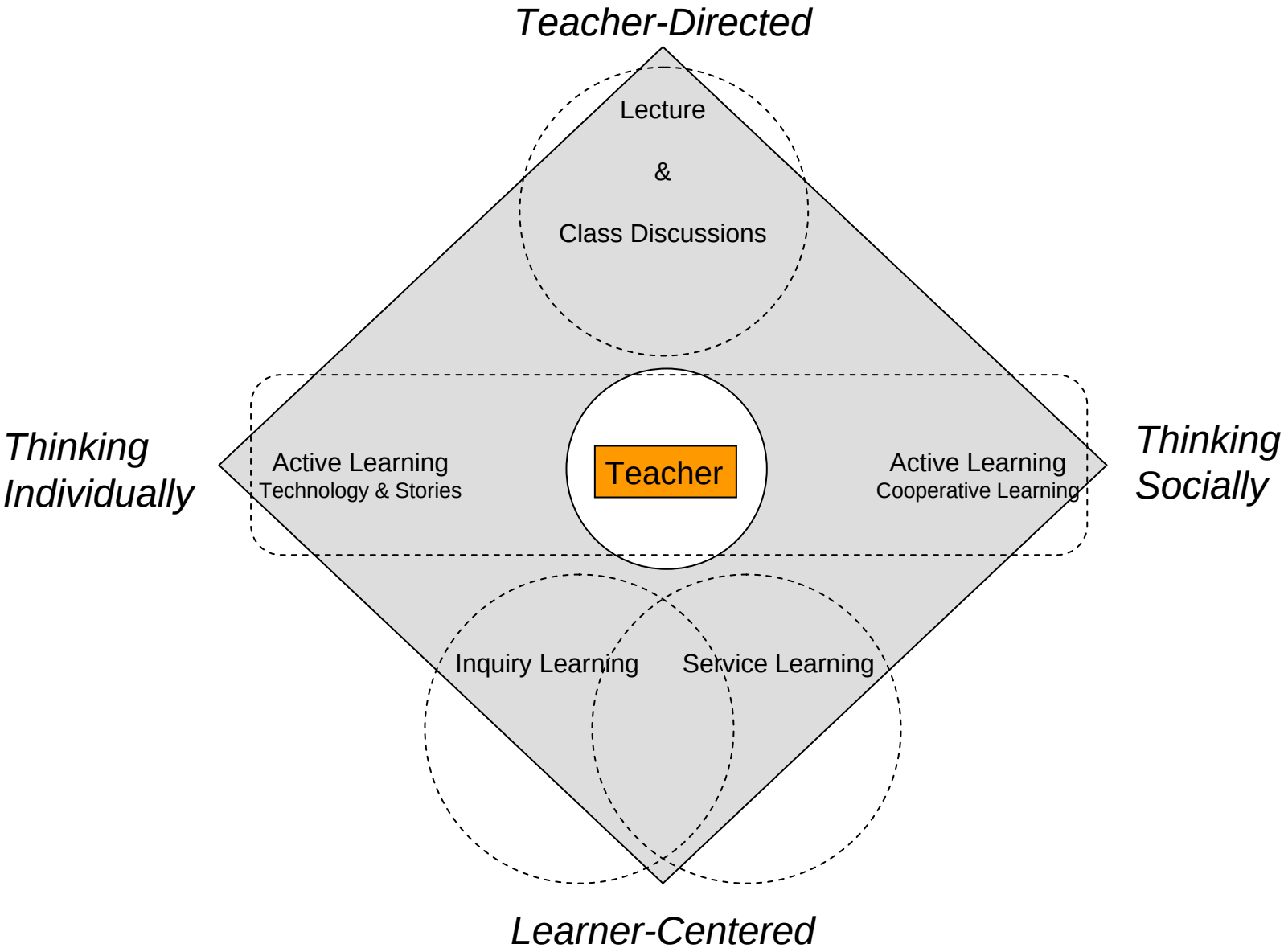
- Meaning is created from **experience**
  - Is grounded in real-life situations
- Encourages **participation**
  - Creativity and discovery in and outside of the classroom
- **Multiple sources** of knowledge
  - Creating and forming concepts, thinking critically, and solving problems

LCT Approaches



- Experiential *or* Authentic Learning
  (Dewey, 1938; Knobloch, 2003; Newmann et al., 1996)
  - Active Learning (Bonwell & Eison, 1991)
  - Inquiry Learning (Bransford, Brown, & Cocking, 1999)
  - Context-Based (Service) Learning
    (Hansman, 2001)

Neil's Diamond



Active Learning

- "Anything that involves students in doing things and thinking about the things they are doing" (Bonwell & Eisen, 1991)
  - Engaging students to think at higher levels through purposefully created well-designed (classroom) activities
- Teaching Methods that make learning…
  - Visual…realia & technology
  - Verbal...story-telling
  - Social…cooperative group learning & discussions
  - Assessment-based…real-time assessments

Inquiry Learning

- Scientific method of inquiry as a means to study a problem in depth
  - Contextualized, ill-structured problems to find meaningful solutions and concepts
  - Inductive approach – in contrast assigning an application problem at the end of a conceptual unit
  - Problems to motivate, focus, and initiate student learning
- Teaching Methods
  - Problem-Based Learning (Savery, 2006; Hmelo-Silver, 2004)
  - Case Study Method (Herreid, 2004)
  - Project-Based Learning (Polamn, 2000)
  - Simulations (Gredler, 2004)

Context-Based Learning

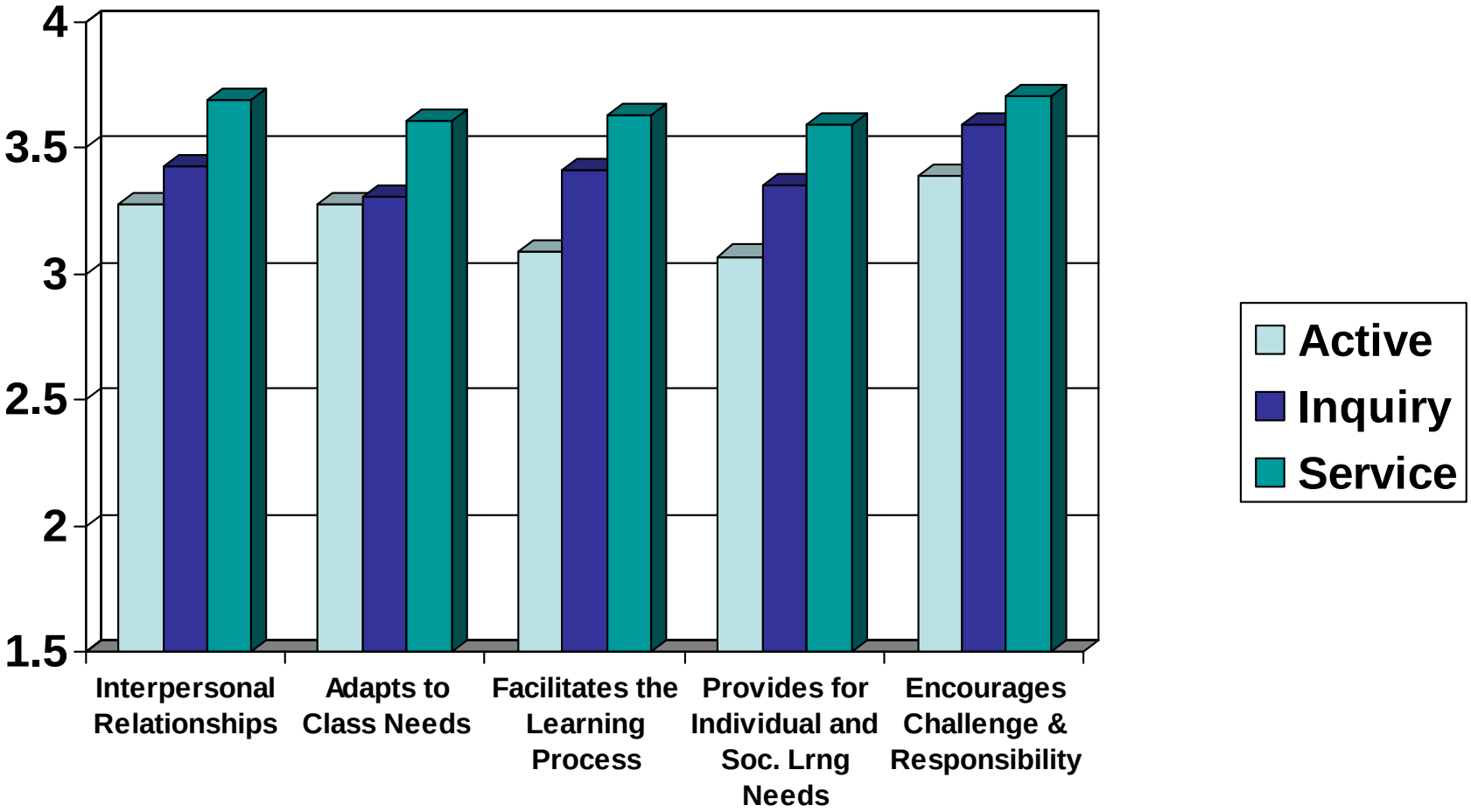
- Service Learning - Engaging students through thoughtfully-organized service in community-based environments outside of the classroom
  - Learn concepts
  - Reflect about the context/culture
  - Develop civic engagement
- Teaching Methods
  - Service Learning (Brown, 1998)
  - Place-Based Learning (Gruenewald, 2003)
  - Lab and Work-Based Learning
  - Internships & Practica
    - Cognitive Apprenticeships (Rogoff, 1990)
    - Situated Learning (Lave & Wenger, 1991)
    - Communities of Practice (Wenger, 1998)

Considerations of LCT Approaches

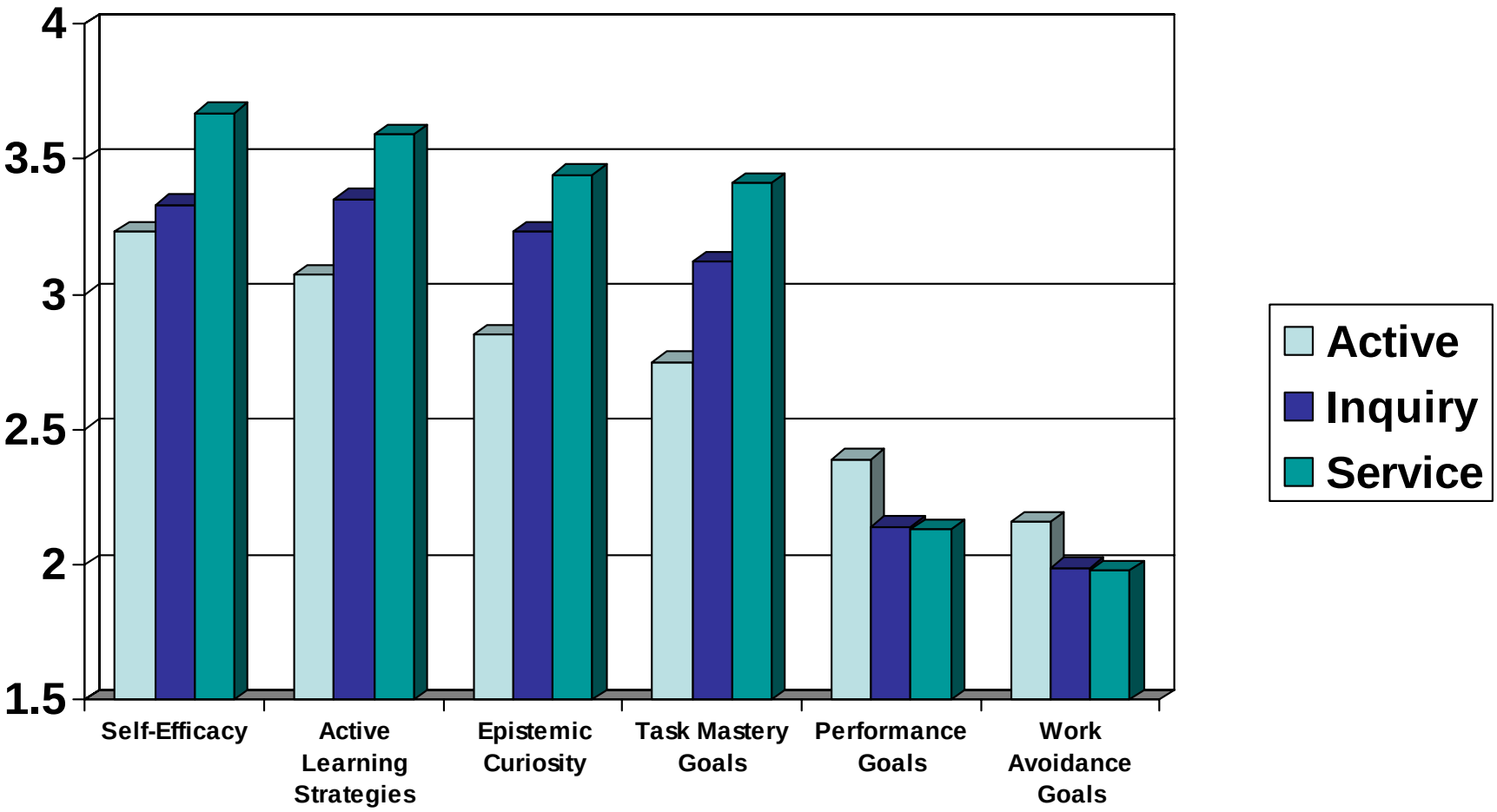
Approach	Active	Inquiry	Service
Driven by	An Engaging Teacher	A Problem to Solve	Real-world Context (outside of classroom)
Purpose	Higher-Level Thinking	Career Development	Personal Development & Empowerment
Level of Student Engagement	+	++	+++
Best Used for Course	Content Delivery (beginning)	Content Application (middle)	Contextual Application (end)
Curriculum Design	100-200 level Survey Courses	300-400 level Discipline Specific Courses	300-400 level Capstone Courses

What do students say about learner-centered teaching?

Student Perceptions of LCT by Approach (*N* = 357)



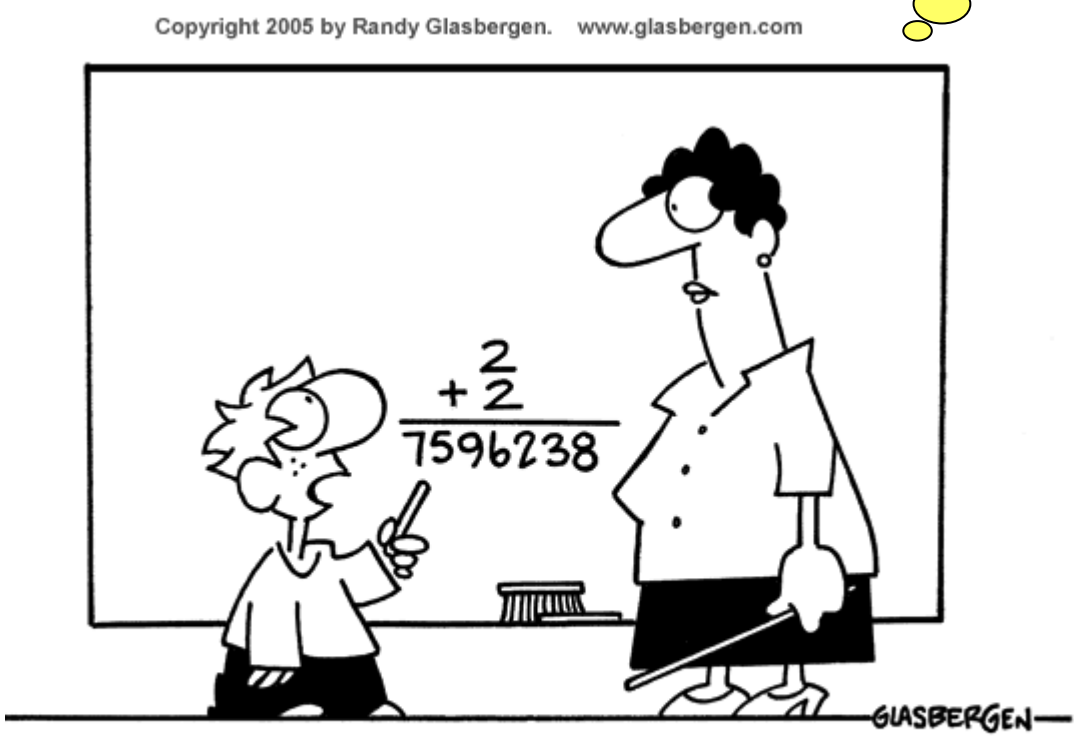
Student Motivation and Cognitive Engagement by LCT Approach (*N* = 357)



Thinking about Teaching

- Teaching approaches and strategies **create** learning contexts and experiences **which inform** learning outcomes
  - Learning tasks (McCombs & Whisler, 1997)
  - Roles of educator and learners (Weimer, 2002)
  - Learning environment and context (Young, 2003)

I think it's time for a break.



"In an increasingly complex world, sometimes old questions require new answers."

LCT Examples in the College of ACES

Active Learning

- Dr. Gary Kling
  - Associate Professor & NACTA Teacher Fellow
  - Department of Natural Resources and Environmental Sciences
  - Research
    - Development and evaluation of computer-aided instruction for landscape plant identification; culture and use, selection and improvement of woody landscape plants; use of pelletized landscape leaf waste as a preemergent herbicide carrier for nursery crop production
  - Courses
    - HORT 301 - Woody Landscape Plants I
      HORT 302 - Woody Landscape Plants II


HORT 301 & 302
Identification, culture and usage of trees, shrubs and vines in the landscape

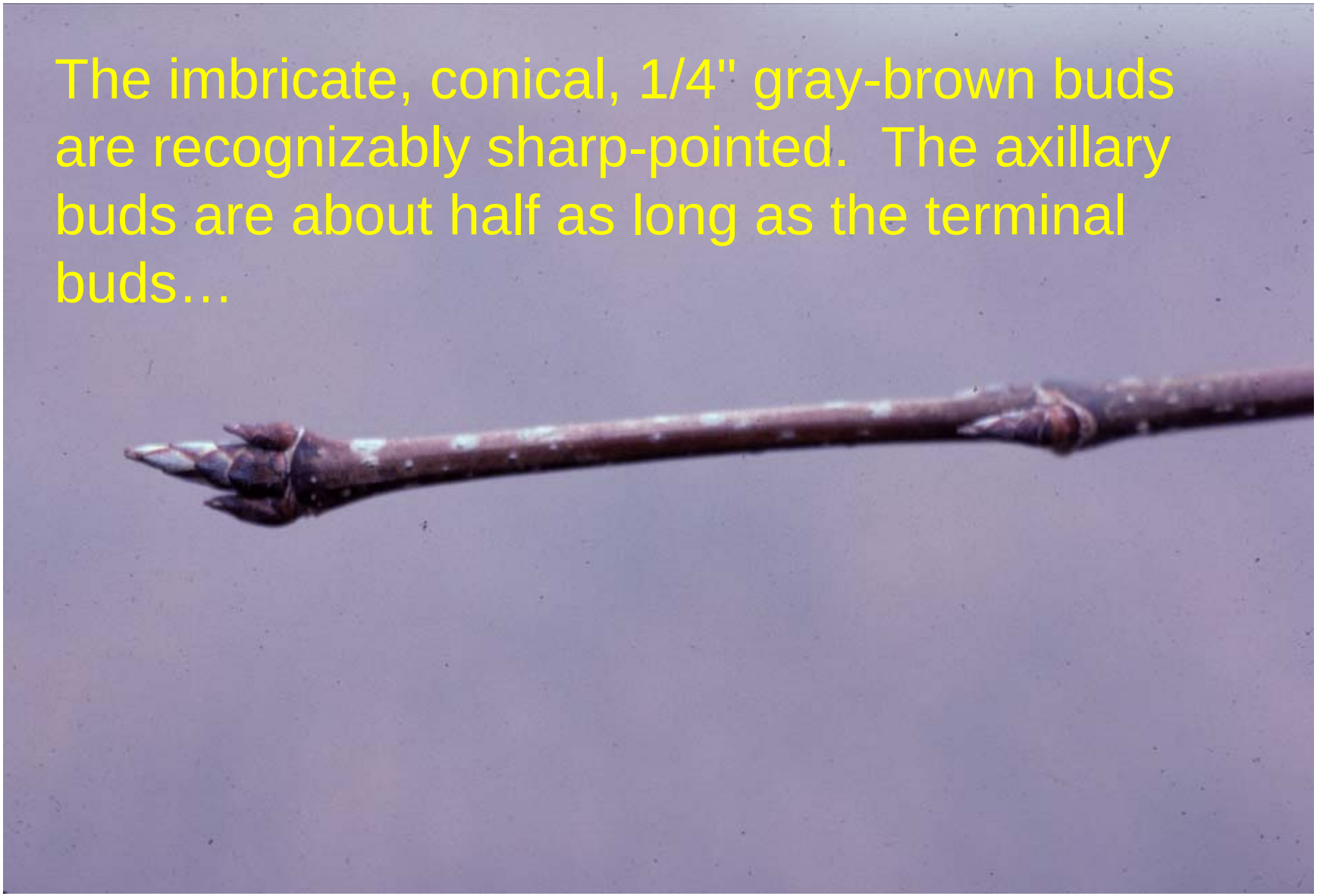
Acer saccharum

Sugar maple


ntissima
oneysuckle
Kolkwitzia amabilis
Beautybush
Calycanthus floridus
Common Sweetshrub
Corylus maxima
'Purpurea' Purple
Giant Filbert
Corylus avellana
'Contorta' Harry Lauder's
Walkingstick
Corylus avellana
European Filbert
Fallopia japonica
var. compacta
Low Japanese
Fleeceflower

Leaves:
Opposite, simple, orbicular, 3 to 6” long and across, 3- to 5-lobed, acuminate apex, cordate base, moderately deep sinuses; variable but generally dark green…

The imbricate, conical, 1/4" gray-brown buds are recognizably sharp-pointed. The axillary buds are about half as long as the terminal buds…



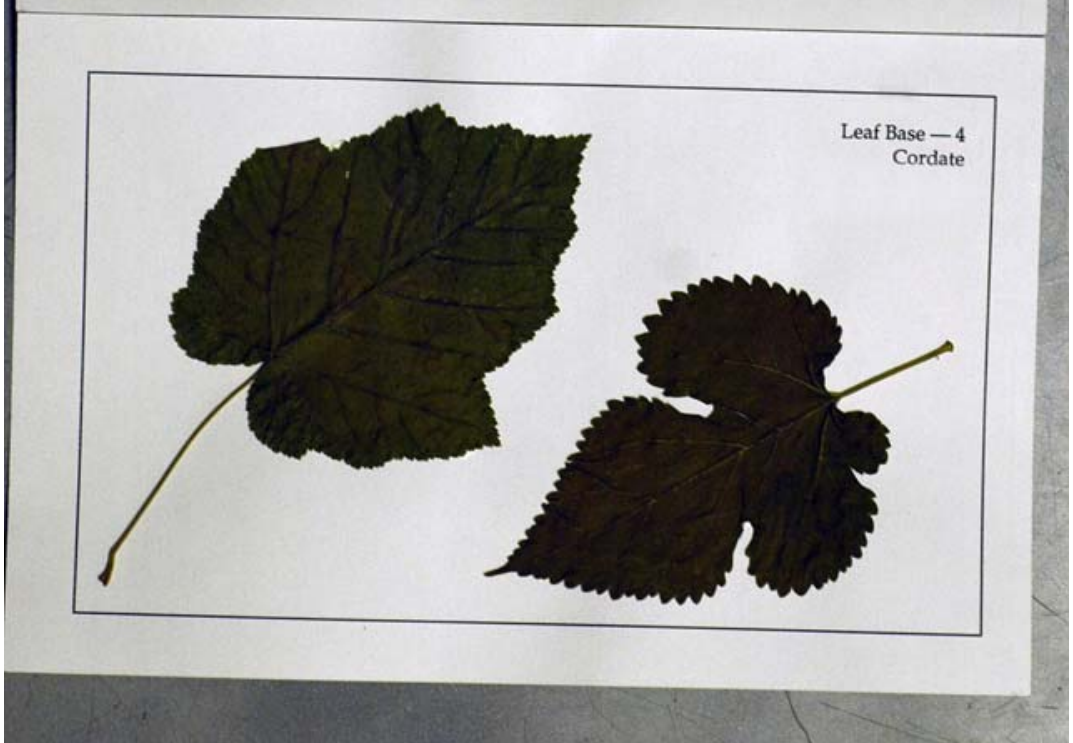
Botanical Terminology

- Week 1
- **Acuminate**
- **Acute**
- **Cordate**
- **Doubly serrate**
- **Elliptic**
- **Incised**
- **Lanceolate**
- **Lobed**
- **Lobulate**
- **Oblanceolate**
- **Opposite**
- **Ovate**
- **Serrate**
- **Simple**
- **Subcordate**
- **Truncate**

- Weeks 2-3
- **Alternate**
- **Crennate-serrate**
- **Elliptic**
- **Emarginate**
- **Impressed**
- **Oblique**
- **Oblong**
- **Obovate**
- **Orbicular**
- **Oval**
- **Rounded**
- **Simple**
- **Sub-opposite**
- **Suborbicular**
- **Whorled**


7 Leaf Shapes
Ovate
Lanceolate
Cordate
Eliptical
Spatulate
Oblanceolate


Leaf Base — 5
Oblique


Leaf Base — 4
Cordate

UNIVERSITY OF ILLINOIS

Home Contact

UI Plants :Botanical Terminology

Advanced Search ▷

Select Plant: Choose a genus

Resources Links

Botanical Terminology Tutorial

The purpose of this tutorial is to introduce basic botanic terminology to students using verbal and visual examples to help describe and learn woody plant material. Explore the various helpful leaf identification features. Start by choosing one of the categories below. Relevant definitions, photos, and links to plants with similar features will be displayed.

Leaf Characteristics


Leaf Apex


Leaf Arrangement


Leaf Base


Leaf Margin


Leaf Shape


Venation

Download Assignment Instructions (pdf) (doc)

Glossary
A working glossary of terms seen

Available Illustrations (pdf):

Please login to use the tutorial and quiz.

NetID:

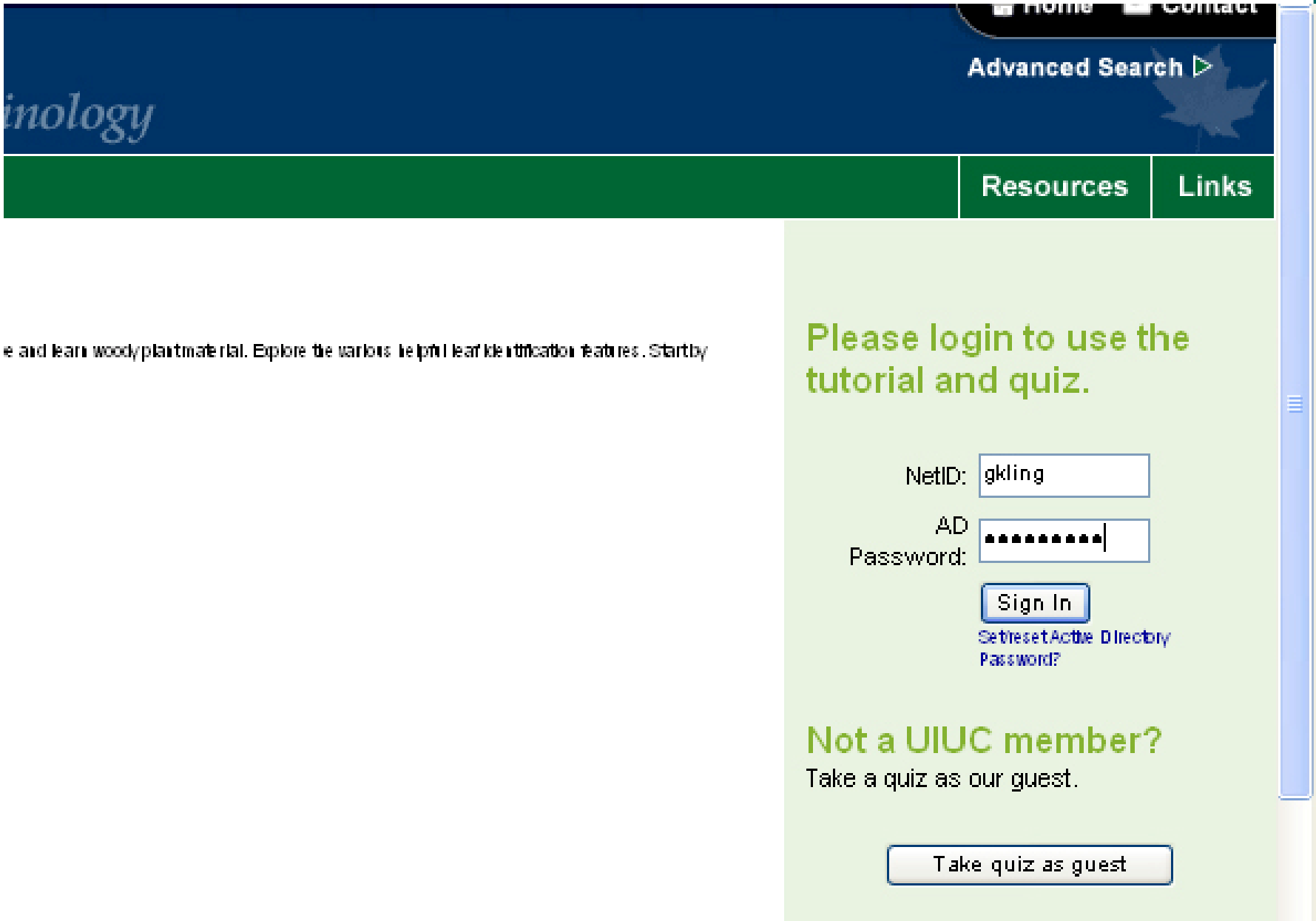
AD Password:

Sign In

Set/reset Active Directory Password?

Not a UIUC member?
Take a quiz as our guest.

Take quiz as guest


Home
Contact
Advanced Search
inology
Resources
Links
e and learn woody plant material. Explore the various helpful leaf identification features. Start by
Please login to use the tutorial and quiz.
NetID:
gkling
AD Password:
Sign In
Set/reset Active Directory Password?
Not a UIUC member?
Take a quiz as our guest.
Take quiz as guest

UNIVERSITY OF ILLINOIS

UI Plants :Botanical Terminology

Home | Contact

Advanced Search

Select Plant: Choose a genus

Resources | Links

Acuminate

Saucer Magnolia
(*Magnolia x soulangiana*)

Acute

Common Periwinkle
(*Vinca minor*)

Emarginate

Fite-leaved Akebia
(*Akebia quinata*)

Mucronate

Purple-leaved Japanese barberry
(*Berberis thunbergii var. atropurpurea'*)

Obtuse

Sargent Flowering Crabapple
(*Malus sargentii*)

Rounded

Common Smoketree
(*Cotinus coggygria*)

Truncate

Apex: The Tip of the Leaf

The leaf tip, or apex, is used to help describe the leaf. There are many species with leaves that differ only slightly by shape, but can be readily distinguished by their apices.

Illustrations of Leaf Apices (pdf)

Acuminate
Sides curving concavely upward and inward then tapering to a fine point on the leaf apex

Acute
An angle that is less than 90° with straight lines and having a point on a leaf apex.

Emarginate
The apex of the leaf is notched towards the petiole at the midvein.

Mucronate
Leaf apex tipped with short abrupt point on midvein.

Obtuse
Rounded leaf margin, greater than 90° at apex.

Rounded
Wide curved shape that is wider than Obtuse with less of a point, while not being so flattened as to approach Truncate.

Truncate
Leaf base or apex is perpendicular to leaf petiole and relatively straight across.

Botanical Terminology

- Arrangement
- Venation
- Shapes
- Margins
- Apices
- Bases

QUIZ Yourself!

UNIVERSITY OF ILLINOIS

Home | Contact

UI Plants :Botanical Terminology

Advanced Search

Select Plant: Choose a genus

Resources | Links

Saucer Magnolia
(Magnolia x soulangiana)

Apple Serviceberry
(Amelanchier x grandiflora)

Japanese Maple
(Acer palmatum)

American chestnut
(Castanea dentata)

Gray Birch
(Betula populifolia)

Leaf Apex: Acuminate

Acuminate Leaf Apex

Definition: Sides curving concavely upward and inward then tapering to a fine point on the leaf apex

Description: A Japanese Maple shows that each of the 5 lobes have acuminate apices.

Botanical Terminology > Leaf Apex > Acuminate

Botanical Terminology

- Arrangement
- Venation
- Shapes
- Margins
- Apices
- Bases

QUIZ Yourself!

Notes about this tutorial.

UNIVERSITY OF ILLINOIS

Home Contact

Advanced Search

Select F

Resources Links

Botanical Terminology

Arrangement

Venation

Shapes

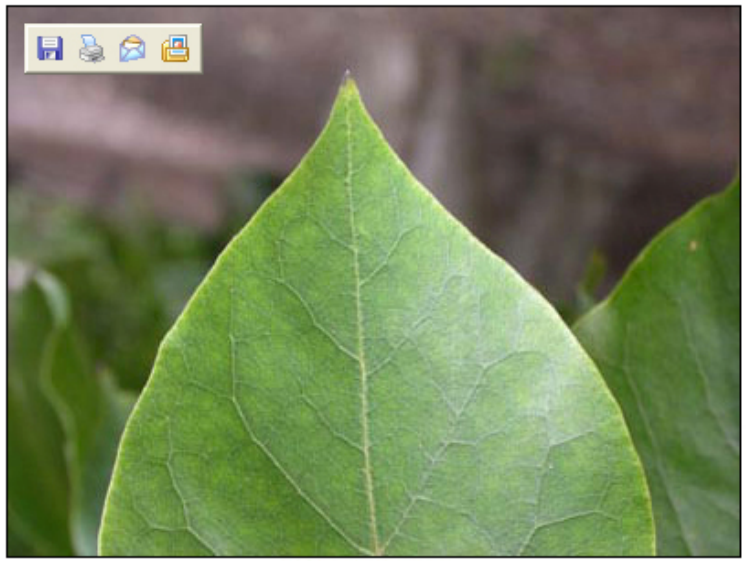
Margins

Apices

Bases

QUIZ Yourself!

http://plants.nres.uiuc.edu/bigphoto.asp?api-acum-magso-tn....



Saucer Magnolia
Magnolia x soulangiana

Done Internet

d inward then tapering to a fine point on the leaf apex

ch of the 5 lobes have acuminate apices.

Notes about this tutorial.

UNIVERSITY OF ILLINOIS

Home | Contact | Search: Plant Name GO

Advanced Search

UI Plants :Woody Ornamentals

Select Plant: Choose a genus | Magnolia x soulangiana

Resources | Links

More Photos

Magnolia x soulangiana
Saucer magnolia

Known for its showy pinkish purple saucer-like flowers, this small tree is one of the most popular magnolias in the landscape. There are many cultivars of this hybrid species whose parents are Magnolia denudata and Magnolia liliiflora.

Habit:	Rounded to broad-rounded, low-branching, multi-stemmed
Size:	20-30' high
Texture:	Medium
Hardiness:	Zone 5a USDA
Family:	Magnoliaceae

PLANT DETAILS

- Habit
- Leaves
- Buds
- Stems
- Flowers
- Fruits
- Fall Color
- Bark
- Culture

Alternate

Common Hackberry
(Celtis occidentalis)

Opposite

Hedge Maple
(Acer campestre)

Subopposite

Common Privet
(Ligustrum vulgare)

Whorled

Northern Catalpa
(Catalpa bignonioides)

The Importance of Leaf Arrangement

Leaf arrangement is one of the first steps in helping to narrow down the options of woody plant identification. There are two types of arrangement that are usually discussed, arrangement of leaves at a node, and arrangement of leaves along the stem. Here we are concerned with arrangement of leaves at a node.

Leaf Arrangement Illustration (pdf)

Alternate
Leaves or Stems situated one at a node. Leaves can alternate in a distichous pattern along only two sides of the stem.

Opposite
Leaves appear directly across from each other arising at one node.

Subopposite
Leaves appear near opposite but not exactly opposite at a node without a fascicle.

Whorled
Three or more leaves arising at a node.

Dichotomous

Ginkgo
(*Ginkgo biloba*)

Impressed

Cornelliancherry Dogwood
(*Cornus mas*)

Palmate

Japanese Maple
(*Acer palmatum*)

Parallel

Umbrellaplne
(*Sciadopitys verticillata*)

Pinnate

American Elm
(*Ulmus americana*)

Reticulate

Sugar hackberry
(*Celtis laevigata*)

Veins of Leaves

Often veins follow the shape of the leaf. They can curve along the leaf following the margin, or they can break the margin and cause the leaf edges to end in fine points, bristles, or spines. The veins can provide interesting textures to the leaf surfaces. This helps in describing the plant and in enjoying its beauty.

As with many of the leaf characteristics, leaf veins can display muliple characteristics such as having both impressed and reticulate veins.

Illustration of Leaf Venation(pdf)

Dichotomous
Veins extend from a common point forming a "y" pattern fanning out. Also means divided into two. Such as 'dichotomous key'.

Impressed
Tissue near veins appear to pucker, giving veins a sunken or embossed appearance. Appearing to be pressed into the leaf.

Palmate
Several primary veins of approximately equal size radiating from a common point like fingers on a hand.

Parallel
Veins that run the length of a leaf and may come together at the leaf tip.

Pinnate
A leaf with a prominent midvein and secondary veins running along both sides of the midvein forming a ladder or v-pattern.

Reticulate
Veins forming a net-like pattern on the leaf.

Awl-shaped

Singleseed Juniper
(*Juniperus squamata*)

Cordate

Eastern Redbud
(*Cercis canadensis*)

Deltoid

Eastern Cottonwood
(*Populus deltoides*)

Elliptical

Common Boxwood
(*Buxus sempervirens*)

Falcate

Pecan
(*Carya illinoinensis*)

Flabellate

Ginkgo
(*Ginkgo biloba*)

Lanceolate

Leatherleaf Viburnum

Linear

English Yew

The Importance of Leaf Shape

Knowing the shape of a leaf can help easily identify a woody plant. There are many ways to describe a leaf's shape, listed here are some of the more common terms.

Illustrations of Leaf Shapes (pdf)

- Awl-shaped
- Cordate
- Deltoid
- Elliptical
- Falcate
- Flabellate
- Lanceolate
- Linear
- Oblanceolate
- Oblong
- Obovate
- Orbicular
- Ovate
- Perfoliate
- Rhombic
- Scale-like
- Spatulate

Crenate

Katsuratree
(*Cercidiphyllum japonicum*)

Dentate

Arrowwood Viburnum
(*Viburnum dentatum*)

Doubly-serrate

American Elm
(*Ulmus americana*)

Entire

Common Boxwood
(*Buxus sempervirens*)

Incised

Stephanandra
(*Stephanandra incisa*)

Involute

China Girl Meserve Holly
(*Ilex x meserveae 'China Girl'*)

Lobed

Lobulate

The Mystery of Margins

Sometimes there are subtle differences in leaf margins and, more often than not, leaves display multiple characteristics. Many of the spirea species have serrations only at the tips while the rest of the leaf is entire. Such leaves can be hard to describe with a single word.

Illustration of Leaf Margins (pdf)

- Crenate
- Dentate
- Doubly-serrate
- Entire
- Incised
- Involute
- Lobed
- Lobulate
- Revolute
- Serrate
- Serrulate
- Sinuate
- Spinose
- Undulate

Botanical Terminology

Arrangement
Venation
Shapes
Margins
Apices
Bases

QUIZ Yourself!

Acute

Apple Serviceberry
(*Amelanchier x grandiflora*)

Attenuate

Winged Euonymus
(*Euonymus alatus*)

Auriculate

English Oak
(*Quercus robur*)

Cordate

Katsuratree
(*Cercidiphyllum japonicum*)

Cuneate

Star Magnolia
(*Magnolia stellata*)

Oblique

Common Hackberry
(*Celtis occidentalis*)

Rounded

Hardy Rubber Tree

Truncate

Amur Maple

Leaf Bases

The leaf base consists of the bottom of the leaf where the leaf attaches to the petiole.

Illustrations of Leaf Bases (pdf)

Acute
An angle that is less than 90° with straight lines and having a point. This can be found in leaf apex or base.

Attenuate
Leaf tissue tapers down the petiole (toward the base) to a narrow base always having some fleshy leaf on either side of the petiole.

Auriculate
Ear-lobe shaped leaf base(s) attached to petiole.

Cordate
Heart-shaped leaf base with the notched part at the base of the leaf.

Cuneate
Narrow wedge-shaped leaf base tapering to a point at the petiole.

Oblique
Unequal leaf bases, slanting, one side larger, wider or rounder than the other

Rounded
Smooth curve forming part of a circle.

Truncate
Leaf base or apex is perpendicular to leaf petiole and relatively straight across.

Botanical Terminology

Arrangement
Venation
Shapes
Margins
Apices
Bases

QUIZ Yourself!

Botanical Terminology Quiz History

The purpose of this tutorial is to introduce basic botanic terminology to students using verbal and visual examples to help describe and learn woody plant material. Explore the various helpful leaf identification features. Start by choosing one of the categories to the left. See definitions, photos, and links to plants with similar features.

Overall Quiz Average: 100.00% **Total Questions Answered:** 10 **Total Correct:** 10

Score	Date Taken	Running Average
10 Quiz Details	8/18/2005 15:17	100.00%

Notes about this tutorial.

UNIVERSITY OF ILLINOIS

UI Plants :Botanical Terminology

Select Plant: Choose a genus

Botanical Terminology Quiz

The purpose of this tutorial is to introduce basic botanic terminology to students using verbal and visual examples to help describe and learn woody plant material. Explore the various helpful leaf identification features. Start by choosing one of the categories to the left. See definitions, photos, and links to plants with similar features.

Correct!

What is the Leaf Arrangement of the plant shown here?

- ○ Subopposite
- ◉ Whorled
- ○ Opposite
- ○ Alternate

Submit

Notes about this tutorial.

Botanical Terminology Quiz

The purpose of this tutorial is to introduce basic botanic terminology to students using verbal and visual examples to help describe and learn woody plant material. Explore the various helpful leaf identification features. Start by choosing one of the categories to the left. See definitions, photos, and links to plants with similar features.

Correct!

The *Quercus robur* shown in this photo illustrates what type of Leaf Base?

- ○ Attenuate
- ◉ Cuneate
- ○ Auriculate
- ○ Rounded
- ○ Cordate

Submit

Notes about this tutorial.

UNIVERSITY OF ILLINOIS

UI Plants :Botanical Terminology

Select Plant: Choose a genus

Botanical Terminology Quiz

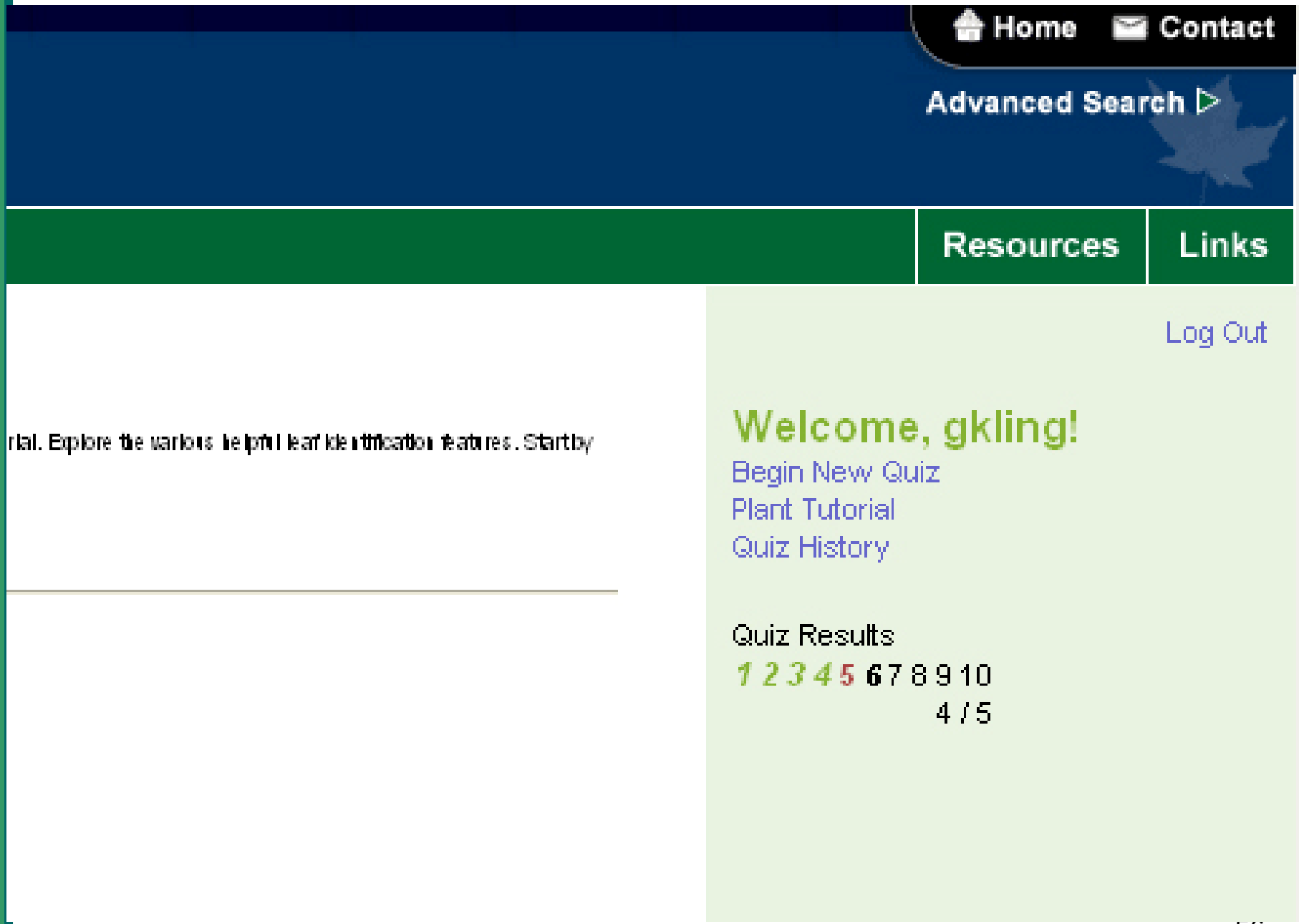
The purpose of this tutorial is to introduce basic botanic terminology to students using verbal and visual examples to help describe and learn woody plant material. Explore the various helpful leaf identi choosing one of the categories to the left. See definitions, photos, and links to plants with similar features.

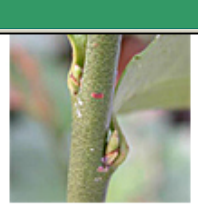
Wrong! The correct answer was Auriculate.

Amur Maple demonstrates what Venation feature?

- Parallel
- Dichotomous
- Impressed
- Reticulate
- Pinnate

Submit


Home
Contact
Advanced Search
Resources
Links
rial. Explore the various helpful leaf identification features. Start by
Log Out
Welcome, gkling!
Begin New Quiz
Plant Tutorial
Quiz History
Quiz Results
1 2 3 4 5 6 7 8 9 10
4 / 5



What is the Leaf Arrangement of the plant shown here?

- Whorled
- *SUBOPPOSITE*
- Opposite
- Alternate

What is the Leaf Arrangement of the plant shown here?

- Subopposite
- *WHORLED*
- Opposite
- Alternate

The *Quercus robur* shown in this photo illustrates what type of Leaf Base?

- Attenuate
- **Cuneate**
- *AURICULATE*
- Rounded
- Cordate

Amur Maple demonstrates what Venation feature?

- Parallel
- Dichotomous
- Impressed
- Reticulate
- *PINNATE*

The *Populus deltoides* shown in this photo illustrates what type of Leaf Margin?

- Revolute
- Dentate
- Sinuate
- *CRENATE*
- Doubly-serrate

Corneliancherry Dogwood demonstrates what Leaf Base feature?

- Auriculate
- *ROUNDED*
- Truncate
- Cuneate
- Attenuate

UNIVERSITY OF ILLINOIS

UI Plants :Botanical Terminology

Select Plant: Choose a genus

Botanic Project Administration

Manage Categories
Manage Photographs
Manage Questions
Manage Users
Take Quiz
Quiz Results
Botanial Tutorial

Recent Activity

This table lists all users of the site within the last 60 minutes and displays how many pages each user has viewed.

Username	Page Views
gkling	26


Leaf Apex Acute
Leaf Margin Double-serrate
Surface Glaborous
Venation Pinnate
Betula nigra (River Birch)


Leaf Apex Acute
Leaf Margin Serrate
Fraxinus Excelsior 'Hessei' (Hesse European Ash)


Leaf Apex Acute
Venation Reticulate
Vinca minor (Common Periwinkle)


Leaf Apex Acuminate
Leaf Division Palmate
Venation Palmate
Acer palmatum (Japanese Maple)


Leaf Apex Acuminate
Venation Pinnate
Amelanchier x grandiflora (Apple Serviceberry)


Leaf Apex Acuminate
Leaf Margin Entire
Magnolia x soulangiana (Saucer Magnolia)


Leaf Apex Acute
Leaf Margin Serrate
Venation Pinnate
Ulmus parvifolia (Chinese Elm)


Leaf Apex Emarginate
Leaf Margin Entire
Akebia quinata (Five-leaved Akebia)


Leaf Apex Emarginate
Leaf Margin Serrate
Venation Pinnate
Alnus glutinosa (European Alder)


Leaf Shape Linear
Venation Parallel
Sciadopitys verticillata (Umbrella pine)


Leaf Apex Acute
Leaf Apex Mucronate
Leaf Margin Entire
Berberis thunbergii var. atropurpurea' (Purple-leaved Japanese barberry)


Leaf Apex Mucronate
Leaf Margin Entire
Cotoneaster apiculatus (Cranberry Cotoneaster)

Leaf Apex Mucronate
Leaf Arrangement Alternate
Leaf Margin Entire
Leaf Shape Orbicular
Surface Glaborous
Cotoneaster horizontalis (Rock Cotoneaster)


Leaf Apex Obtuse
Leaf Margin Entire
Cotinus obovatus (American Smoketree)


Leaf Apex Obtuse
Leaf Margin Entire
Surface Glaborous
Ligustrum vulgare (Common Privet)


Leaf Apex Obtuse
Leaf Margin Double-serrate
Malus sargentii (Sargent Flowering Crabapple)


Leaf Apex Rounded
Cercidiphyllum japonicum (Katsuratree)

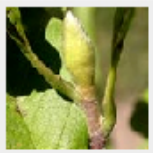

Leaf Apex Rounded
Leaf Margin Entire
Venation Pinnate
Cotinus coggygria (Common Smoketree)

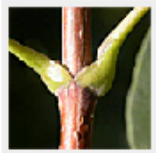

Leaf Apex Obtuse
Leaf Apex Rounded
Leaf Margin Serrate
Surface Glaborous
Crataegus crus-galli (Cockspur Hawthorn)

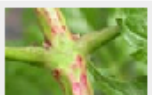

Leaf Apex Truncate
Leaf Division Simple
Leaf Margin Entire
Leaf Margin Lobed
Liriodendron tulipifera (Tuliptree)


Bud Imbricate
Leaf Arrangement Alternate
Amelanchier x grandiflora (Apple Serviceberry)

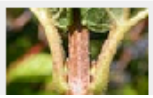

Bud Valved
Leaf Arrangement Alternate
Leaf Base Oblique
Fothergilla gardenii (Dwarf Fothergilla)

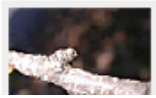

Bud Valved
Leaf Arrangement Alternate
Magnolia stellata (Star Magnolia)


Leaf Arrangement Opposite
Acer campestre (Hedge Maple)


Leaf Arrangement Opposite

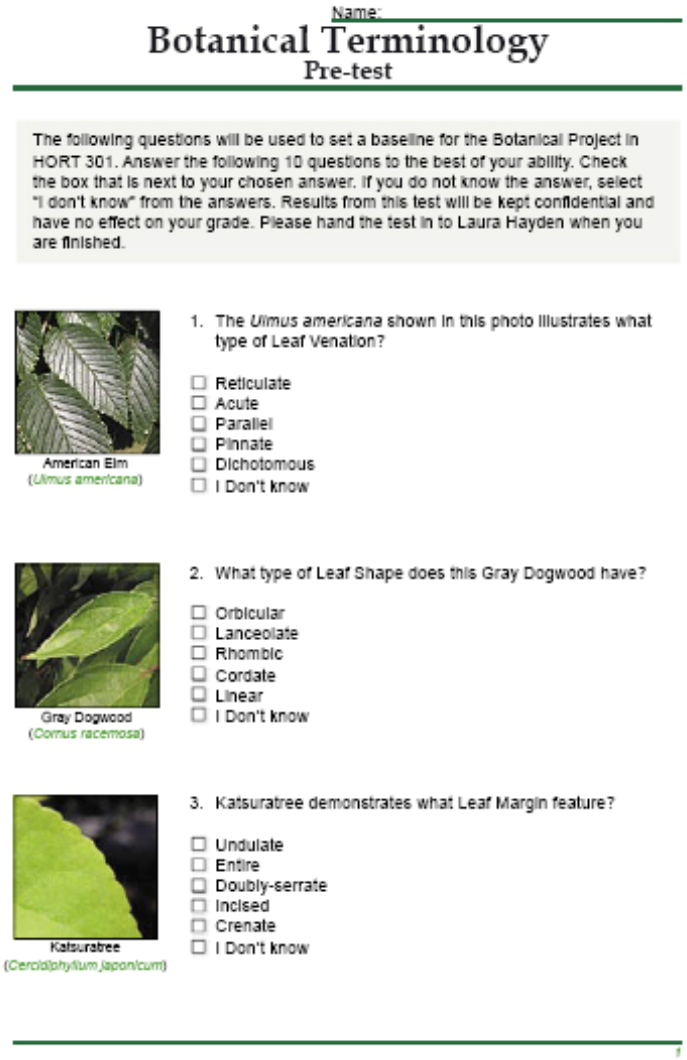

Leaf Arrangement Opposite


Leaf Arrangement Opposite


Leaf Arrangement Subopposite

Pre-test

- This was a 10 question, multiple-choice quiz to establish a baseline of students current understanding of the terminology we wanted to cover.
- Highest score for the whole class was 4 out of 10
- 16% average



Name:

Botanical Terminology

Pre-test

The following questions will be used to set a baseline for the Botanical Project in HORT 301. Answer the following 10 questions to the best of your ability. Check the box that is next to your chosen answer. If you do not know the answer, select "I don't know" from the answers. Results from this test will be kept confidential and have no effect on your grade. Please hand the test in to Laura Hayden when you are finished.

American Elm
(*Ulmus americana*)

1. The *Ulmus americana* shown in this photo illustrates what type of Leaf Venation?

- ☐ Reticulate
- ☐ Acute
- ☐ Parallel
- ☐ Pinnate
- ☐ Dichotomous
- ☐ I Don't know

Gray Dogwood
(*Cornus racemosa*)

2. What type of Leaf Shape does this Gray Dogwood have?

- ☐ Orbicular
- ☐ Lanceolate
- ☐ Rhombic
- ☐ Cordate
- ☐ Linear
- ☐ I Don't know

Katsuratree
(*Cercidiphyllum japonicum*)

3. Katsuratree demonstrates what Leaf Margin feature?

- ☐ Undulate
- ☐ Entire
- ☐ Doubly-serrate
- ☐ Incised
- ☐ Crenate
- ☐ I Don't know

#11 What botanical term describes the leaf apex?

Results

Table 1. Group comparison using using Cohen's *d* for Effect Size

	Online Tutorial		Leaf Collection		
Knowledge Tests	**Mean**	**SD**	**Mean**	**SD**	**Cohen's *d***
Pre-test	14.0	11.90	18.8	14.53	.36 (small)
Comprehension	89.8	13.27	74.6	17.91	.96 (large)
Retention	49.0	16.33	40.4	21.63	.44 (small)
Motivation					
Extrinisic Motivation	4.70	1.07	4.55	1.25	.13 (trivial)
Intrinsic Motivation	4.63	1.17	4.17	.98	.43 (small)
Task Value Motivation	4.60	1.91	5.11	1.20	.32 (small)
Self-Efficacy Motivation	4.56	1.34	4.12	1.01	.37 (small)
Responsibility for Learning	5.12	1.25	5.13	1.18	.01 (trivial)
Test Anxiety	3.54	1.33	3.79	1.25	.19 (trivial)

Botanical Terminology Website

http://plants.nres.uiuc.edu/

Authors:

Laura Hayden

Gary Kling

Josh Potts

Inquiry Learning

- Dr. Prasanta Kalita
  - Associate Professor & Distinguished Teacher/Scholar
  - Department of Agricultural and Biological Engineering
  - Research
    - Hydrology, watershed quality, modeling erosion and sediment control
  - Courses
    - ABE 221 - Agr and Bio Engineering I
    - ABE 456 - Land and Water Resources Engineering
    - ABE 498 - Non Point Pollution Processes and Control
    - ABE 396/397 - Independent Study/UG Research
    - ABE 599 - Thesis Research
    - ACES 100 - Contemporary Issues in ACES

Inquiry Learning

- ***Definition: Student learning through investigation of complex problems***

- Few teaching strategies:
  - Discussion or dialogues
  - Real-world problem-based
  - Case studies
  - Simulations
  - Independent study/research
  - Group project
  - And others (NOT TRADITIONAL LECTURING)
- Two teaching strategies I use most often….
  - Real-world Problem Based Learning – Small groups
  - Independent study/research – Individual or groups

Example 1

- Real-world problem (short term or semester long)
- *Stream-bank restoration at Camp Atterbury in Indiana*
    - Define the problem, develop questions
    - Develop hypothesis, visit site, investigate, refine questions
    - Develop solution, alternatives, and estimate cost
    - Make reasoned judgments, adjust solutions
    - Write draft, receive critiques, print final report, present results
    - Implementation

Example 2

- Research-based learning (semester or yearly, stepwise)
- *Bioremediation of agricultural chemicals from subsurface drainage outflows*
  - Develop research questions and hypothesis
  - Conduct literature review
  - Develop research proposal and secure funding
  - Design experiments, buy materials, and conduct research
  - Analyze results, provide-reasoned judgments
  - Develop conclusions, write report and present results

Students

- What motivates them to learn?
  - Questions for which they need to find an answer or answers
  - Curiosity and interest drive them to learn
- Steps of learning process
  - Challenge
  - Frustration
  - Finally, satisfaction
- Outcomes
  - Solution to a problem – confidence building
  - Adjusting and refinement of judgments
  - Develop critical thinking by analysis
  - Develop responsibility to do and learn
  - Intellectual growth
  - Prepares them for real-world job market

Service Learning

- Dr. Tony Endress
  - Professor
  - Department of Natural Resources & Environmental Sciences
  - Research
    - Restoration ecology, assembly of plant communities, invasion biology, impacts of ungulate herbivory on plant community structure, and physiological ecology
  - Courses
    - NRES 285 – Restoration Ecology Practicum
    - NRES 294 – Resident Internship
    - NRES 419 - Environment and Plant Ecosystems
    - NRES 420 - Restoration Ecology
    - NRES 512 - Discussions in Natural Resources and Environmental Sciences

Service Learning

- Context + Process → Engagement
- Teaching Perspective
  - Developmental (from student's view)
  - Professional socialization (apprenticeship)
- Teaching Challenges
- Teaching Strategies
  - Authentic project
  - Power of group
  - Reflective practice
  - Feedback
  - Field vignettes & case studies

Power of the Group

- Team composition
- Project simulation
- Accountability
- Responsibilities outside of project

The Situation

Your organization has just assigned you to a newly formed task team which is taking over a secret project presently being handled by Research and Development. Your entire team has been assigned responsibility and authority to design a plan for managing the project, and then—after top management has reviewed and accepted your plans—carry out the project.

None of you has been told anything about the project so far, other than it is expected to grow to sizable proportions, requiring additional people.

The Challenge

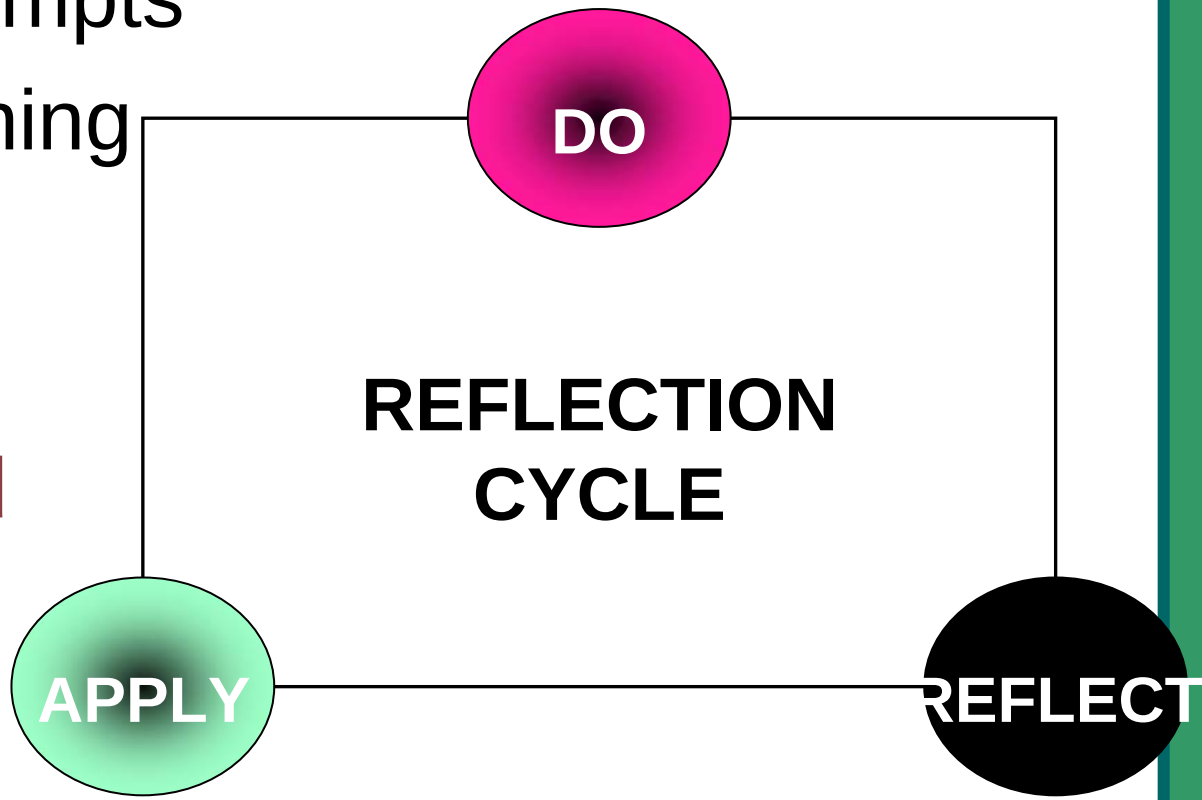
Despite the lack of information regarding the project, your team must now design a preliminary plan for managing it. On the next page is a list of 20 Management Activities (A through T) arranged in random order. Your task is to arrange these activities according to the sequence you would follow in planning, organizing, implementing, and controlling the project. This sequence will be reviewed by top management before you are authorized to begin work on the project.

	Management Activities	Step 1 Individual Sequence	Step 2 Team Sequence	Step 3* Suggested Sequence
A	Find qualified people to fill positions.			
B	Measure progress toward and/or deviation from the project's goals.			
C	Identify and analyze the various job tasks necessary to implement the project.			
D	Develop strategies (priorities, sequence, timing of major steps).			
E	Develop possible alternative courses of action.			
F	Deliver appropriate consequences for individual performance.			

Reflective Practice

- Project records
- Reflective prompts
- Broader meaning

Learning is an evidence-based *journey*



Contributing Within the Context

- Bridging Knowledge
- Feedback
  - Within group
  - Peer
  - Instructor
  - Client
  - Expert
  - Public Presentation
  - Practitioner jury
  - Peer performance evaluation

Teaching Strategies

- Student-centered learning
  - Know your
    - Students
    - Personal teaching perspective
    - Various roles

Enable the learning process

Summary

- Strategies to facilitate student learning
  - Adapt to students' level of understanding & ways of thinking
  - Address authentic problem
  - Require teamwork, responsibility, & effective communication
  - Incorporate input & feedback from professionals & peers
  - Generate implemented outcomes in the community

Students learn, community benefits

Questions?

Practical Applications ACT

- Groups
  - Introductory Survey Course
  - Upper-Level Undergraduate, Discipline-Specific Course
  - Large Classroom (>150 students) Course
- Instructions
  - Select a course
  - Clarify the purpose and goals for the course
  - Identify the big ideas (concepts) and topics that should be taught in the course
  - Identify the teaching strategies and learning activities that would be used to meet the goals for the course and reach all types of learners
  - Identify procedures that will be used to assess student learning and determine if the goals were met
  - Outline how you would get students to buy-in and be successful in a course that engages them using learner-centered teaching strategies
- Share Ideas

Course Design WS

Learning Goals	Learning Activities	Student Assessment
1. Understand and remember key concepts, terms, and relationships		
2. Know how to use the content		
3. Be able to relate this subject to other subjects		
4. Understand the personal and social implications of knowing about this subject		
5. Care about the subject		
6. Know how to keep on learning about this subject after the course is over		

Fink, 2003

Possible Course Structures

Approach	Large Course	Introduction	300-400 Discipline -Specific	Capstone
Active	75%	65%	45%	15%
Inquiry	20%	25%	40%	20%
Service	5%	10%	15%	65%

Concluding Remarks

- Observations
- Key Points
- Resources
- Evaluation

LEARNER CENTERED
teaching approaches

Please register in the LCT Network
http://lct.aces.uiuc.edu

Have a Great Year!

FYI:
http://lct.aces.uiuc.edu

Contact:
nknobloc@purdue.edu
(765) 494-8439

Thank You